The Information Intake of the Blind; Designing the Virtual Cane

Amanda Brown

2004 NASA Academy Research Associate

Eastern Kentucky University

PI: Nancy Maymard Code 900
Goddard Space Flight Center
Greenbelt, MD 20771

ABSTRACT

The goal of this research was to understand the diversity of technology that is used to encourage independent mobility of the blind. The fundamental human factors that the blind undergo while involved in understanding and making scenes from *soundscapes* are being studied. Tone reactions will be studied for the development of more productive information systems. Subjects studied will listen to individual tones from various instrumental sources to determine the rate and accuracy of the speed at which they could be understood. The simplification of tones was also incorporated into the overall goals of the study. The human factor research will lead to the development of an incorporated virtual cane design and a possible outreach program for blind youth. Teaching methods for this system would be similar to the human factor testing of the original audio display tones.

Introduction: The Blind World

In the United States today there are approximately one million legally blind adults living. Only small amounts of research have been done about the lives and learning abilities of the legally blind community. Nearly one in five blind adults lives in poverty. The current employment rate for blind adults is 19% with an 81% unemployment rate. Blind adults are less well educated than the general population. The average number of years of education for blind adults is 11.4 years. Only 12% of blind adults are college graduates. (1)

New, improved, and available technologies and resources are in great demand for the employable American blind population. Only one in four use visual "equipment." The most common choices are white canes, telescopic lenses, and Braille. Less than 1% uses a guide dog, and the use of adapted computer technology is rare. (1) Some forms of audio devices that work as human form of sonar such as ***vIOCe Technology Systems,*** have been developed. However, few human interface studies has been done with this type audio based technologies. (2)

In order to develop new and inventive technologies to deal with the problems The blind have within society, the human factors involved must first be understood. It is known, the sensory pathway of humans begins with a neural message being sent to the cerebral cortex where the signal is then coded and relayed to various areas of the brain. Almost all of the sensor signals that are taken in by the brain are then relayed to the thalamus. The sensory information is diverted to intended areas according to which of the five senses are being interrupted. (1)

From previous research established with the blind community, it is known that this is where the visually impaired neural pathways diverges from that of the normally sighted population. Members of the blind community that have been blind from birth are able to use the devoted neural pathways of sight for other sensory stimulus. (3) It is also known the blind have an enhanced memory of the audio sounds. (4)

Goal of the NFB/NASA Initiative

The NASA Blind Initiatives Program with the National Federation of the Blind (NFB) was established in 2004 to bridge the gap between the American blind and the NASA Science community. The goal of this research is to add in the knowledge needed for development of technology for the blind.

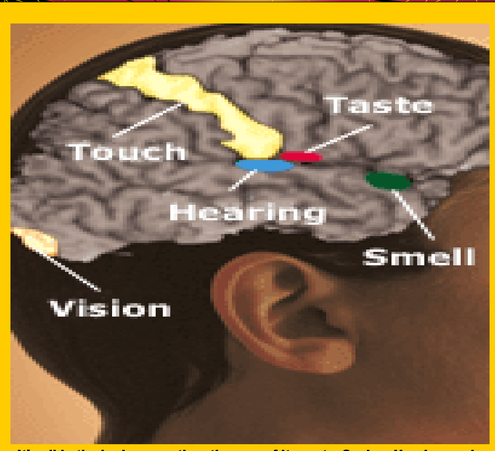
Individual project contribution

- Identify the needs of the blind community through background research and interviewing of the blind community.

- Understand the voids of knowledge in motor sensory interaction when applied to the blind.

- Study the correlation between kinesthetic movement and auditory impulse uptake.

- Research and design the most successful method of data collection for analysis with auditory / kinesthetic interaction data.



It's all in the brain: more than the sum of its parts. Seeing, Hearing, and Smelling the World Howard Hughes Medical Institute

Testing Methods

Musical tones will be delivered to human subjects both legally blind and non-visual impaired via computers outfitted with listening devices. Participants will listen to random patterns of instrumental tones to discern the type and depth of the various instruments. The subject will then translate the audio information into key strokes on a computer key board. The key Strokes can then be Studied for accuracy which will allude to the speed at the blind are able to transform their remaining senses Into meaningful information compared that of the average sighted individual.

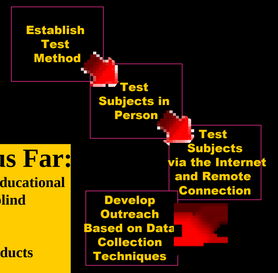
81% of the American Blind Population are Unemployed

An Example of Audio Interpreted Key Strokes

20 Tones

A akdl s; ls sld;aj;

Flow Chart of Methods for Data Collection



Elements Established Thus Far:

1. Connections with governmental agencies, educational institutions, non-for-profit organization, and blind individuals.

2. A literature search of past research and products designed to be used by the blind community.

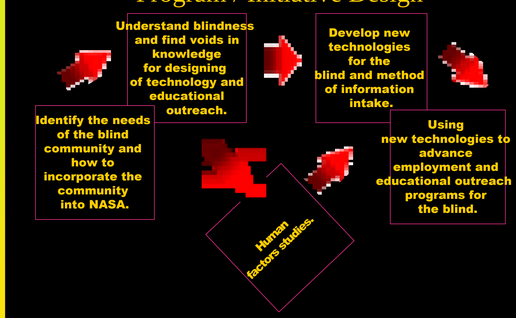
3. An understanding of some of the human factors involved in the mobility of the blind.

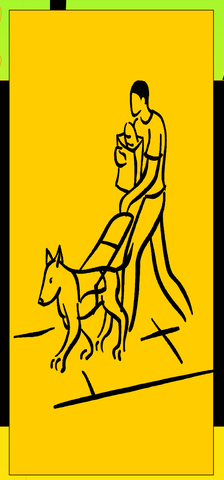
4. Experimental procedure and arrangement of subjects to be studied.

Most Common Causes of Blindness in American Adults

Diseases of the Retina - 26 percent
Diabetes - 7 percent
Glaucoma - 7 percent
Cataracts - 4 percent
Accidents Accounted for 15 percent

Program / Initiative Design





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